REMARKS

Status of the Claims

Claims 19-26 are pending, with claims 19 and 23 being independent. Applicants respectfully request the Examiner to reconsider and withdraw the outstanding rejections in view of the following remarks.

Specification

The disclosure has been objected to due to informalities. In response, the specification has been amended to update the status of U.S. Patent Application No. 09/842,673, filed on April 27, 2001, which issued as U.S. Patent No. 6,682,711 on January 27, 2004. Accordingly, Applicants respectfully request withdrawal of the objection to the disclosure.

Drawings

The drawings have been objected to under 37 CFR § 1.83(a). Applications point out that according to 37 CFR § 1.81(a), "[t]he applicant for a patent is required to furnish a drawing of his or her invention where necessary for the understanding of the subject matter sought to be patented." Applicants respectfully submit that the pending apparatus and process claims are readily understandable by one of skill in the art without drawings. Accordingly, Applicants respectfully submit that drawings are not necessary in the present application and Applicants respectfully request withdrawal of this objection.

Claim Rejections under 35 U.S.C. § 102

Claims 19-26 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 2,450,500 ("Clark"). Applicants respectfully disagree with this rejection; therefore, the rejection is traversed.

Clark relates to controlling the liberation of the large quantities of heat that occurs during the course of the Fischer Tropsch reaction. (Col. 1, lines 40-53). As Clark explains, this liberation of heat presents a serious obstacle to the industrial use of the Fischer Tropsch process. (Id.) Clark discloses a process for controlling the temperature

of the Fischer Tropsch reaction to a narrow limit in order to obtain high yields of desirable products. (Col. 4, lines 7-15). Accordingly, Clark discloses a Fischer Tropsch synthesis process in which hydrocarbons are produced by passing synthesis gas through a plurality of catalyst zones in which each catalyst zone contains a synthesis catalyst having an optimum activity for that zone. (Col. 4, lines 43-52). Clark discloses that the catalyst activity is varied from zone to zone such that progressively increasing temperatures are required for each successive zone in the direction of flow of gases therethrough to maintain optimum conversion in each zone for the desired hydrocarbon product. (Col. 4, lines 56-62).

Clark states that a particularly novel feature of the invention is that the problem of heat and temperature control in the exothermic process is solved, not by dissipating the heat, but by utilizing the exothermic heat to gradually increase the temperature of the flowing gases and the catalyst itself. (Col. 4, lines 62-71). Clark discloses that the increase in temperature is compensated and utilized by selecting a plurality of catalysts placed in successive zones wherein each successive catalyst possesses a higher optimum temperature of reaction than the preceding catalyst. (Col. 4, line 71-Col. 5, line 2).

Clark discloses an overall apparatus for the synthesis of hydrocarbons incorporating the successive zones of catalysts (Figures 2 and 3). In the apparatus, Clark discloses including a sulfur removal unit (12) in which both inorganic and organic sulfur are removed by conventional methods known in the art. (Col. 8, lines 31-35). The sulfur removal unit (12) is ***upstream of the Fischer Tropsch reactor*** (17) containing the successive zones of catalysts. (Figure 2). Clark discloses the following catalysts in order from lowest optimum reaction temperature to highest optimum temperature: cobalt-thoria, iron, and sintered iron. (Example at Col. 11, 33 – 34 and claim 1). Therefore, according to Clark, gaseous reactants are contacted with cobalt-thoria, followed by iron, and then sintered iron for optimum yield of product.

In contrast, as recited in independent claim 19, the presently claimed invention relates to an apparatus for a Fischer-Tropsch process comprising a gas inlet, for conducting an inlet gas stream, and at least one product outlet with a reactor there between including a Fischer-Tropsch catalyst, the reactor operable at temperatures of

from 175° to 325°C, and a pressure from 1 to 20 atmospheres, and ***a material, included within the reactor and upstream from the Fischer-Tropsch catalyst***. The material is ***present to bind sulfur*** contained in the inlet gas stream and ***does not substantially alter synthesis gas***. The specification discloses that the material is used to bind sulfur in the synthesis gas feed, thus preserving catalyst life. (page 10, lines 18 – 19). The specification further discloses that there are many suitable sulfur-binding materials. (page 10, line 19 – 20). These sulfur-binding materials comprise an element or compound of an element selected from the group consisting of Co, Fe, Mo, W, Zn, Ni, V, Cd, Re, Mn, Pb, Ag, As, Cr, Sb, and mixtures thereof. (claim 20).

As recited in independent claim 23, the presently claimed invention relates to a process for removing sulfur from a synthesis gas in a Fischer-Tropsch reactor. The Fischer-Tropsch reactor includes a gas inlet for conducting an inlet gas stream, at least one product outlet, and a Fischer-Tropsch catalyst. The process comprises placing ***a material within the inlet gas stream and upstream from the Fischer-Tropsch catalyst***. The material is present to ***bind sulfur*** contained in the inlet gas stream and ***does not substantially alter synthesis gas***. A sulfur-containing synthesis gas is passed over the material, thereby removing at least a portion of the sulfur contained in the synthesis gas prior to introducing the synthesis gas to the Fischer-Tropsch catalyst.

To anticipate a claimed invention under §102, a reference must teach each and every element of the claimed invention. *See Lindeman Machinenfabrik GmbH v. American Hoist and Derrick Company*, 221 USPQ 481, 485 (Fed. Cir. 1984).

It is respectfully submitted that in no way does Clark disclose or suggest an apparatus for a Fischer-Tropsch process comprising a gas inlet and at least one product outlet with a reactor there between including a Fischer-Tropsch catalyst and ***a material***, included within the reactor and upstream from the Fischer-Tropsch catalyst, wherein the material is ***present to bind sulfur*** contained in the inlet gas stream and ***does not substantially alter synthesis gas***.

It is further respectfully submitted that in no way does Clark disclose or suggest a process for removing sulfur from a synthesis gas in a Fischer-Tropsch reactor comprising placing ***a material within the inlet gas stream and upstream from the Fischer-Tropsch***

catalyst, wherein the material is present to ***bind sulfur*** contained in the inlet gas stream and ***does not substantially alter synthesis gas*** and passing a sulfur-containing synthesis gas over the material, thereby removing at least a portion of the sulfur contained in the synthesis gas prior to introducing the synthesis gas to the Fischer-Tropsch catalyst.

The Office Action alleges that Clark discloses "a material (67) within the reactor (17, see figure 3) and upstream of Fischer-Tropsch catalyst (68, 69) which can bind sulfur and not substantially alter the gas stream (col. 5, line 64- col. 6, line 9)", (Office Action dated November 1, 2004, page 4). However, as described above, Clark discloses a conventional sulfur removal unit (12) upstream of the Fischer Tropsch reactor (17). (Figure 1), and within the Fischer Tropsch reactor, Clark discloses successive zones of ***Fischer Tropsch catalysts for conducting the Fischer Tropsch reaction*** wherein each successive catalyst possesses a higher optimum temperature of reaction than the preceding catalyst. In particular, Clark discloses a catalyst order of cobalt-thoria, iron, and sintered iron. The three serially arranged catalysts are described by Clark as ***synthesis catalysts*** and Clark discloses that utilizing the process as described therein ***optimum conversion*** is maintained in ***each catalyst zone*** for the desired hydrocarbon product.

Accordingly, it is respectfully submitted that the first catalyst of Clark is ***not*** present ***to bind sulfur*** contained in the inlet gas stream to protect the following catalysts and certainly, the first catalyst of Clark is ***not*** a material that ***does not substantially alter synthesis gas***, as recited by claim 19. The first catalyst in Clark is present to conduct the Fischer Tropsch reaction and raise the temperature of the gaseous reactants for the next successive catalyst.

Therefore, it is respectfully submitted that the apparatus and process of Clark for controlling the temperature of the Fischer Tropsch process is significantly different than the apparatus and process of the present invention for removing sulfur from a synthesis gas in a Fischer Tropsch process. In way no does Clark disclose or suggest using a sulfur-binding material included within the reactor and upstream from the Fischer-Tropsch catalyst, wherein the material is present to bind sulfur contained in the inlet gas stream and wherein the material does not substantially alter synthesis gas. As Clark does

not teach each and every element of the claims, it cannot anticipate the presently claimed invention. Accordingly, withdrawal of the rejection under 35 U.S.C. § 102(b) is respectfully requested.

Conclusion

For the reasons noted above, the art of record does not disclose or suggest the inventive concept of the presently claimed invention as defined by the claims.

In view of the foregoing remarks, reconsideration of the claims and allowance of the subject application is earnestly solicited. The Examiner is invited to contact the undersigned at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted,

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